REMARKS

The Official Action mailed June 5, 2003, designated on its first page as Paper No. 9, but which applicant believes should be designated Paper No. 10, has been carefully studied along with the newly cited and applied prior art. The claims in the application are now claims 1-4, 7, 21-23 and 28-32; these claims recite novel and unobvious subject matter under Sections 102 and 103, and therefore should be allowed.

Accordingly, applicants respectfully request favorable reconsideration and allowance.

Claim 23 has been objected to under Rule 75(c). This objection is respectfully traversed.

Claim 4 indicates that the "sheets" have "different coefficients of linear expansion woven by one or more kinds of reinforcing fibers". Claim 23 is more specific in that it indicates that this is accomplished by providing "different sheets of reinforcing fibers" having different coefficients of linear expansion.

Withdrawal of the objection is respectfully requested.

Claims 24-26 have been rejected under the first paragraph of Section 112. While applicant does not agree, nevertheless, claims 24-27 have now been deleted, so that

applicant need not address this rejection at the present time. However, applicant respectfully reserves the right to pursue claims directed to the subject matter of claims 24-26 in a continuing application without any penalty whatsoever, if applicant chooses to do so, applicant in such a case relying on applicant's rights including those provided by Sections 120 and 119.

Claims 1-4, 7 and 21-30 have been rejected under the second paragraph of Section 112. This rejection is respectfully traversed.

As regards claims 24-26, again applicant notes that this rejection need not be addressed at the present time. The comments made above with respect to claims 24-26 are respectfully repeated by reference.

With respect to the other rejected claims, applicant submits that the fiber reinforced resin composite material according to the present invention has a reduced or low coefficient of thermal expansion regardless of what it is compared to among such composites in the prior art. Terminology of this type has been repeatedly held by the Board and the Courts to be acceptable, noting for example the decision of the Supreme Court of the United States in the famous *Eibel* case, 261 U.S. 45. Also see *Charvat v. Commissioner*, 182 USPQ 577, 585; and *Modine v. ITC*, 37 USPQ 2d

1609. The person of ordinary skill in the art would understand what is claimed in light of applicant's specification.

Applicant respectfully requests withdrawal of the rejection.

Before addressing the various prior art rejections, applicant believes that it would be helpful to review the present invention in more detail in comparison with what has been done in the past to control thermal expansion of fiber reinforced resin composites. Thus, in the past, the following methods have been used:

(1) The method of combining the reinforcing fiber and the matrix resin both with a low coefficient thermal expansion;

(2) The method of combining reinforcing fiber with positive coefficient thermal expansion and reinforcing fiber with negative coefficient thermal expansion;

(3) The method of combining reinforcing fibers with matrix resin, which have conflicting coefficient thermal expansion respectively.

However, all of these past methods lessen the choice of both of the reinforcing fiber and matrix resins. Therefore, ultimately the material which has appropriate chemical or mechanical properties cannot be obtained.

On the other hand, the present invention takes into account more than just two kinds of reinforcing fibers, i.e. it also takes the matrix resin into account. At least one kind of reinforcing fiber has a negative coefficient thermal expansion. Combining the plural of reinforcing fibers, the coefficient of thermal expansion as a whole can be controlled. And finally the coefficient of thermal expansion of reinforcing fibers balances with coefficient of thermal expansion of matrix resin.

According to the present invention, many kinds of reinforcing fibers can be selected. And as a whole, an appropriate composite material can be obtained, which is suitable for various requirements.

An appropriate reinforcing fiber type is understood by the following equation, which is described on page 11 of specification:

$$\alpha = (E_L * \alpha_L + E_L * \alpha_T + \mu_{LT} * E_L * \alpha_L + \mu_{LT} * E_L * (\alpha_L + \alpha_T)) / (E_L + E_T + 2\ \mu_{LT} * E_L)$$

α represents the linear coefficient of thermal expansion of quasi-isotropic composite.

In this expression, moreover, E_L, E_T, μ_{LT}, α_L and α_T represent mechanical and thermal properties of the polymer composite, which is reinforced unidirectionally by long fibers. They are calculated from mechanical and thermal properties of each of the materials which comprise the

unidirectional composite, and the method of calculating them can be easily found in standard texts of composite materials.

These properties are:

(1) For the polymer:

Young's module, Poisson's ratio, linear coefficient of thermal expansion.

(2) For reinforcing fiber:

On the surface spanned by the fiber and transverse directions.

Shear modules and Poisson's ratio.

Along the fiber direction.

Tensile modules and linear coefficient of thermal expansion.

Along the fiber transverse direction.

Tensile modules, linear coefficient of thermal expansion.

(3) The fiber volume fraction.

It should be noted that for the composite with several reinforcing fibers, the fiber properties are estimated by the weighted average of the fibers in question.

Claims 1-3, 7, 24 and 25 have been again rejected under Section 102 as anticipated by Miyadera. This rejection is respectfully traversed.

As claims 24 and 25 have been cancelled, this rejection need not be addressed with respect to such claims at the present time.

Applicant does not deny that some control is achieved in Miyadera because the selected fibers disclosed, i.e. the combination of aromatic polyamide and glass fibers, have positive and negative expansion coefficients respectively. But this does not end the matter. In Miyadera the coefficient of thermal expansion of the matrix resin is not counterbalanced by the coefficient of thermal expansion of the reinforcing fibers. Therefore, Miyadera does not obtain and does not teach the degree of control achieved according to the present invention.

Applicant respectfully requests withdrawal of the rejection.

Claims 1, 2, 4, 21, 23, 24 and 26 have been rejected under Section 102 by Kashima et al USP 5,462,791 ("Kashima"). This rejection is respectfully traversed.

Again, this rejection need not be addressed with respect to claims 24 and 26 at the present time in view of the deletion of such claims from the present file, without prejudice.

Kashima is not unlike Miyadera wherein fibers having opposite coefficients of thermal expansion are combined to

counterbalance their respective expansion coefficients. However, the expansion coefficients of the combined reinforcing fibers are not counterbalanced to the coefficient of thermal expansion of the matrix resin. Kashima does not anticipate any of applicant's claims.

Applicant respectfully requests withdrawal of the rejection.

Claims 1, 2, 4, 21, 23, 24, 26, 28 and 30 have been rejected under Section 102 as anticipated by Leibowitz USP 4,689,110 ("Leibowitz"). This rejection is respectfully traversed.

As understood, Leibowitz discloses a laminate with alternating layers of PTFE and graphite fibers impregnated with an epoxy resin. The expansion coefficient of the graphite fiber impregnated with epoxy resin is near zero. However, the expansion coefficient of the combination of more than two types of reinforcing fibers, i.e. taking into account both the PTFE fibers and the graphite fibers, is not counterbalanced to the expansion coefficient of the resin. Leibowitz does not anticipate applicant's claims.

Applicant respectfully requests withdrawal of the rejection.

Claims 3, 7, 22, 25, 27 and 29 have been rejected as obvious under Section 103 from Leibowitz in view Yuan USP 4,020,209 ("Yuan"). This rejection is respectfully traversed.

Leibowitz has been described above. Yuan describes a coated triaxial fabric used to prepare a laminated product, wherein the triaxial fabric provides superior isotropic tear resistance and strength. Applicant does not see that fibers having opposing coefficients of thermal expansion are used or taught, or that there is any indication of balancing fibers relative to the matrix resin. Thus, at most Yuan simply discloses that laminates have been previously made with fibers running in three different directions.

Applicant does not see how one of ordinary skill in the art would combine Yuan with Leibowitz, i.e. more particularly modify anything disclosed in Leibowitz as taught by Yuan. The prior art does not teach how to correlate that which is taught by Yuan with the objective of Leibowitz. Moreover, even if the combination were obvious, it would not reach the claimed subject matter.

Applicant respectfully requests withdrawal of the rejection.

Claim 27 has been rejected as obvious under Section 103 from Miyadera in view of Yuan. This rejection is respectfully traversed.

Both references have been described above. Applicant's comments made above relative to the proposed combination of Leibowitz in view of Yuan apply equally to the proposed combination of Miyadera in view of Yuan, and such comments are therefore respectfully repeated by reference.

Applicant respectfully requests withdrawal of the rejection.

Claims 28 and 29 have been rejected as obvious under Section 102 from Miyadera in view of Leibowitz. This rejection is respectfully traversed.

Miyadera and Leibowitz have been discussed above, and Miyadera has been discussed previously. Applicant's remarks made above and previously regarding these references are respectfully repeated by reference.

Applicant respectfully submits that these references would not obviously have been combined because Miyadera teaches away from any combination with Leibowitz. As pointed out in the preceding reply, Miyadera requires a mixture of aromatic polyamide fibers and glass fibers. To substitute graphite fibers in Miyadera would be to fly in the face of Miyadera and do what Miyadera suggests would be unacceptable. This cannot have been obvious.

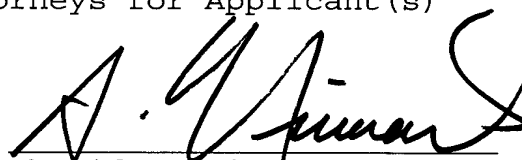Applicant respectfully requests withdrawal of the rejection.

The prior art documents made of record and not relied upon have been noted, along with the implication that such documents are deemed by the PTO to be insufficiently pertinent to warrant their application against any of applicants' claims.

Applicant respectfully request favorable reconsideration and allowance.

Respectfully submitted,

BROWDY AND NEIMARK, P.L.L.C.
Attorneys for Applicant(s)

By Sheridan Neimark
Registration No. 20,520

SN:jec
Telephone No.: (202) 628-5197
Facsimile No.: (202) 737-3528
G:\BN\O\Ohta\Kubomura 1\PTO\AMD05SEPT03.doc